CLAIMS

WHAT IS CLAIMED

1. A computer-implemented method for generating a warping effect in an image having a plurality of regions, each associated with a distortion vector, the method comprising:

defining a path segment vector in response to user movement of a brush cursor;

modifying one or more distortion vectors having originations covered by the cursor based on the path segment vector; and

repeating defining and modifying to produce a warping effect.

2. The computer-implemented method of claim 1, further comprising:

sampling a source image using the distortion vectors to produce a destination image.

3. The computer-implemented method of claim 2, wherein each distortion vector ends at a mesh point in a distortion mesh, and wherein modifying distortion vectors comprises:

multiplying the path segment vector by a predetermined matrix, thereby producing a product vector;

interpolating each distortion vector between mesh points that surround the end of the product vector, thereby producing an interpolated vector; and

combining the product vector and the interpolated vector.

4. The computer-implemented method of claim 3, wherein the direction of the path segment vector is opposite to the direction of movement of the brush cursor.

5. The computer-implemented method of claim 4, wherein multiplying causes the magnitude of the product vector to be substantially twice the magnitude of the path

segment vector.

6. The computer-implemented method of claim 4, wherein multiplying causes the direction of the product vector to differ from the direction of the path segment vector by substantially 90 degrees.

7. The computer-implemented method of claim 3, wherein the interpolation for the distortion vector is linear, bilinear, or of higher order.

8. The computer-implemented method of claim 3, wherein

defining comprises defining a plurality of path segment vectors in response to user manipulation of a brush cursor, wherein the magnitude of each path segment vector depends on its location within the brush cursor; and

modifying comprises modifying a distortion vector using the nearest path segment vector.

9. The computer-implemented method of claim 1, further comprising:

dividing the image into a frozen area and a unfrozen area by a boundary in response to user input;

moving the cursor from the frozen area into the unfrozen area in response to user input; and

modifying the distortion vectors in the unfrozen region covered by the cursor to produce a reflection effect based on a portion of the frozen area.

10. The computer-implemented method of claim 9, wherein each distortion vector ends at a mesh point in a distortion mesh, and wherein modifying distortion vectors comprises:

multiplying the path segment vector by a predetermined matrix, thereby producing a product vector;

interpolating each distortion vector between mesh points that surround the end of the product vector, thereby producing an interpolated vector; and

combining the product vector and the interpolated vector.

11. The computer-implemented method of claim 1, wherein the distortion vectors form a distortion vector field, further comprising:

generating one or more further distortion vector fields;

modifying each distortion vector field using a different time-varying function;

combining the resulting distortion vector fields to produce a time-varying distortion vector field; and

repeatedly sampling the source image using the time-varying distortion vector field to produce an image having an animated image.

12. The computer-implemented method of claim 11, wherein the sum of the time-varying functions is one at any given time.

13. The computer-implemented method of claim 12, wherein each of the time-varying functions is continuous.

14. A computer program product, tangibly stored on a computer-readable medium, for generating a warping effect in an image having a plurality of regions, each associated with a distortion vector, comprising instructions operable to cause a programmable processor to:

define a path segment vector in response to user movement of a brush cursor;

modify one or more distortion vectors having originations covered by the cursor based on the path segment vector; and

repeat defining and modifying to produce a warping effect.

15. The computer program product of claim 14, further comprising instructions operable to cause a programmable processor to:

sample a source image using the distortion vectors to produce a destination image.

16. The computer program product of claim 15, wherein each distortion vector ends at a mesh point in a distortion mesh, and wherein the instructions operable to cause a programmable processor to modify distortion vectors comprise instructions operable to cause a programmable processor to:

multiply the path segment vector by a predetermined matrix, thereby producing a product vector;

interpolate each distortion vector between mesh points that surround the end of the product vector, thereby producing an interpolated vector; and

combine the product vector and the interpolated vector.

17. The computer program product of claim 16, wherein the direction of the path segment vector is opposite to the direction of movement of the brush cursor.

18. The computer program product of claim 17, wherein the instructions operable to cause a programmable processor to multiply cause the magnitude of the product vector to be substantially twice the magnitude of the path segment vector.

19. The computer program product of claim 17, wherein the instructions operable to cause a programmable processor to multiply cause the direction of the product vector to differ from the direction of the path segment vector by substantially 90 degrees.

20. The computer program product of claim 16, wherein the interpolation for the distortion vector is is linear, bilinear, or of higher order.

21. The computer program product of claim 16, wherein the instructions operable to cause a programmable processor to define comprise instructions operable to cause a programmable processor to define a plurality of path segment vectors in response to user manipulation of a brush cursor, wherein the magnitude of each path segment vector depends on its location within the brush cursor; and

the instructions operable to cause a programmable processor to modify comprise instructions operable to cause a programmable processor to modify a distortion vector using the nearest path segment vector.

22. The computer program product of claim 14, further comprising instructions operable to cause a programmable processor to:

divide the image into a frozen area and a unfrozen area by a boundary in response to user input;

move the cursor from the frozen area into the unfrozen area in response to user input; and

modify the distortion vectors in the unfrozen region covered by the cursor to produce a reflection effect based on a portion of the frozen area.

23. The computer program product of claim 22, wherein each distortion vector ends at a mesh point in a distortion mesh, and wherein the instructions operable to cause a programmable processor to modify distortion vectors comprise instructions operable to cause a programmable processor to:

multiply the path segment vector by a predetermined matrix, thereby producing a product vector;

interpolate each distortion vector between mesh points that surround the end of the product vector, thereby producing an interpolated vector; and

combine the product vector and the interpolated vector.

24. The computer program product of claim 14, wherein the distortion vectors form a distortion vector field, further comprising instructions operable to cause a programmable processor to:

generate one or more further distortion vector fields;

modify each distortion vector field using a different time-varying function;

combine the resulting distortion vector fields to produce a time-varying distortion vector field; and

repeatedly sample the source image using the time-varying distortion vector field to produce an image having an animated image.

25. The computer program product of claim 24, wherein the sum of the time-varying functions is one at any given time.

26. The computer program product of claim 25, wherein each of the time-varying functions is continuous.